

The d and f-Block Elements

Assertion & Reason Type Questions

consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- c. Assertion (A) is true but Reason (R) is false.
- d. Assertion (A) is false but Reason (R) is true.

Q 1. Assertion (A): Cu^{2+} iodide is not known.

Reason (R): Cu^{2+} oxidises I⁻ to iodine.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 2. Assertion (A): Copper is a non-transition element.

Reason (R): Copper has completely filled d-orbitals in its ground state.

Answer : (d) Copper is a transition element but it has completely filled d-orbitals in its ground state. Hence, assertion is false but reason is true.

Q 3. Assertion (A): Transition metals show their highest oxidation state with oxygen.

Reason (R): The ability of oxygen to form multiple bonds to metals.

Answer : (a) The ability of oxygen to form multiple bonds with metals results in the formation of stable compounds in which metals can exist in their highest oxidation states.

Q 4. Assertion (A): Transition metals have high enthalpy of atomisation.

Reason (R): Greater number of unpaired electrons in transition metals results in weak metallic bonding.

Answer : (c) Transition metals have high enthalpy of atomisation because they have high effective nuclear charge, greater number of valence electrons and some unpaired electrons which result in strong metallic bonding. Hence, assertion is true but reason is false.

Q 5. Assertion (A): Zr and Hf have almost identical radii.

Reason (R): Both Zr and Hf exhibit similar properties.

Answer : (b) Zr and Hf have almost identical radii due to lanthanoid contraction. Also, both Zr and Hf exhibit similar properties. Hence, assertion and reason both are true but reason is not the correct explanation of assertion.

Q 6. Assertion (A): Separation of Zr and Hf is difficult.

Reason (R): Because Zr and Hf lie in the same group of the periodic table.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q 7. Assertion (A): Actinoids form relatively less stable complexes as compared to lanthanoids.

Reason (R): Actinoids can utilise their 5f orbitals along with 6d orbitals in bonding, but lanthanoids do not use their 4f orbital for bonding.

Answer : (d) Assertion (A) is false but Reason (R) is true. Assertion is false because actinoids form more stable complexes as compared to lanthanoids.

Q 8. Assertion (A): Magnetic moment values of actinides are lesser than the theoretically predicted values.

Reason (R): Actinide elements are strongly paramagnetic.

Answer : (b) The magnetic moment is less as the 5f electrons of actinides are less effectively shielded which results in quenching of orbital contributions. Also, they are strongly paramagnetic due to the presence of unpaired electrons.

Q 9. Assertion (A): Zinc is not regarded as a transition element.

Reason (R): In zinc, 3d-orbitals are completely filled in its ground state as well as in its oxidised state.

Answer : (a) Zinc is not regarded as a transition element because it forms only Zn^{2+} ions with all the 3d electrons present. Zn has 3d-orbital completely filled by 10 electrons that are paired. Hence, they can't release these electrons and can only lose electrons.

Q 10. Assertion (A): Fe^{2+} acts as a reducing agent.

Reason (R): Fe^{3+} state is stable due to 3d⁵ configuration.

Answer : (a) Fe^{2+} acts as a reducing agent due to the increasing stability of the lower species to which they are reduced. Hence, assertion is true. Also, Fe^{3+} state is stable due to $3d^5$ configuration i.e. half filled electronic configuration. So, reason is also true and it is also the correct explanation of assertion.

Q 11. Assertion (A): Cu cannot liberate hydrogen from acids.

Reason (R): Because it has positive electrode potential.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 12. Assertion (A): The highest oxidation state of osmium is +8.

Reason (R): Osmium is a 5d-block element.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q13. Assertion : Cuprous ion (Cu^+) has unpaired electrons while cupric ion (Cu^{++}) does not.

Reason : Cuprous ion (Cu^+) is colourless whereas cupric ion (Cu^{++}) is blue in the aqueous solution.

Q14. Assertion : Transition metals show variable valency.

Reason : Transition metals have a large energy difference between the ns^2 and $(n - 1)d$ electrons.

Q15. Assertion : Transition metals are good catalysts.

Reason : V_2O_5 or Pt is used in the preparation of H_2SO_4 by contact process.

Q16. Assertion : Magnetic moment values of actinides are lesser than the theoretically predicted values.

Reason : Actinide elements are strongly paramagnetic

ANSWER KEY 13 to 16

Q13 : (b)

Q14 : (c)

Q15 : (a)

Q16 : (d)